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United States Government **Department of Energy**
Rocky Flats Field Office

memorandum

DATE APR 17 2001

REPLY TO ATTN OF AMEI ER/WM NC 01-00720

SUBJECT Fiscal Year 2001 Quick Win Deployment Proposals

TO Carl Lanigan, Subsurface Contaminants Focus Area, Savannah River Operations Office

The Rocky Flats Field Office (RFFO) is pleased to submit this proposal to the Subsurface Contaminants Focus Area (SCFA) in response to its Fiscal Year (FY) 2001 call for Quick Win Deployments The Rocky Flats Environmental Technology Site (Site) welcomes the opportunity to partner with EM-50 and the SCFA to support the implementation of the Additional Testing Of Enhanced Degradation to Remediate Groundwater and Subsurface Soils at the Site

> The use of Hydrogen Release Compound (HRC™) is currently being tested at the Site at one, isolated, location to determine if it is effective in remediation of volatile organic compounds in subsurface soils and groundwater If this methodology can be proven to be effective at the Site, it can reduce worker risk, minimize risk to the environment during remediation, effect a schedule reduction of up to 5 months, realize up to $3 million in cost savings, and result in minimal waste generation with the associated storage, handling, shipping and disposal costs The planned remaining groundwater collection and treatment system, currently scheduled to be initiated in 2003 and completed in 2004 for a projected cost of $2 6 million, can be greatly reduced in scope or potentially eliminated by the success of this project

The RFFO and Kaiser Hill Company L L C (K-H) recognize a need and an application for this proposal The Site will commit the fiscal year resources identified in the proposal to support this Quick Win proposal Funding this proposal will directly help the Site address two important Science and Technology Needs identified in the FY 2001 *Site Needs and Opportunities List* The relevant needs are RF-ER02 - Treatment technology for groundwater contaminated with chlorinated organics in the Industrial Area, and RF-ER14- Characterization/Detection/Verification of non-aqueous phase liquids

The ability of the Site to achieve the end state described in the proposal is based on the current contract between DOE-RFFO and (K-H) effective February 1, 2000 We look forward to selection as a Quick Win Deployment site and continued involvement with SCFA

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DOCUMENT CLASSIFICATION REVIEW WAIVER PER CLASSIFICATION OFFICE

APR 17 2001

If you have any questions, please contact Norma Castaneda at (303) 966-4226 or Gary Huffman at (303) 966-7490

Joseph A Legare
Assistant Manager
for Environment and Infrastructure

Enclosure

cc w/Enc
N Castaneda, ERWM, RFFO
G Huffman, CP, RFFO
L Butler, K-H
Administrative Record

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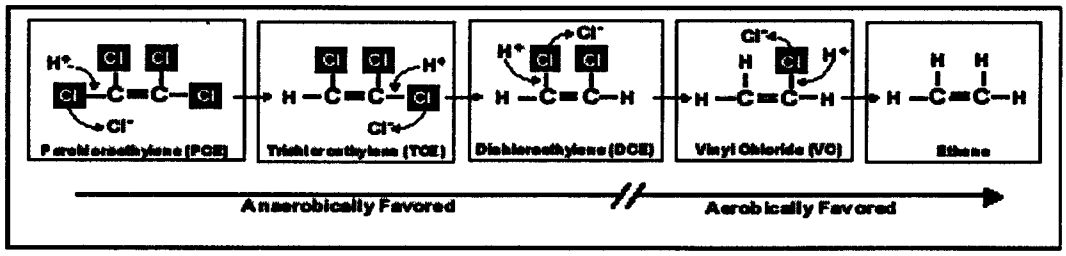
Additional Testing Of Enhanced Degradation To Remediate Groundwater And Subsurface Soils at Rocky Flats Environmental Technology Site

1.0 Technical Proposal

Hydrogen Release Compound (HRC™) has been shown to effectively remediate volatile organic compounds (VOCs) in soil and groundwater at various sites, but has not been proven effective in the low flow, shallow groundwater common at Rocky Flats Environmental Technology Site (Site) The use of HRC™ is currently being tested at the Site at one, isolated, location to determine if it is effective in remediation of volatile organic compounds in subsurface soils and groundwater If this methodology can be proven to be effective at the Site, it can reduce worker risk, minimize risk to the environment during remediation, and save considerable time and funds over what is scoped in the baseline

HRC™ is a proprietary, environmentally safe, food quality, polylactate ester formulated for slow release of lactic acid upon hydration The product has been used at other sites to stimulate rapid degradation of chlorinated VOC contaminants in groundwater and soil The HRC™ is expected to stimulate rapid degradation of chlorinated VOCs found in groundwater and soil at this location HRC™ is expected to be a one-time application at a given location

According to the company-supplied information, HRC™ operates in a complex series of chemical and biologically mediated reactions In the presence of groundwater, HRC slowly releases lactic acid If the appropriate anaerobic microbes (such as acetogens) are present, these will metabolize the lactic acid producing consistent low concentrations of dissolved hydrogen The resulting hydrogen is then used by other subsurface microbes (reductive dehalogenators) to strip the solvent molecules of their chlorine atoms and allow for further biological degradation The degradation series is shown below



Funding for this test was provided by DOE EM50 subsurface program The material was injected into the soils and follow-up monitoring is currently in progress to determine if this methodology is successful Results of the testing are expected to be positive

Additional testing is proposed to determine if this material is effective in broader applications at the Site If demonstrated to be successful at the new locations, this remediation method will be deployed at the Site as a stand-alone remediation technique and potentially in conjunction with traditional remediation methods to prevent the spread of contamination

1.1 Deployment Approach

The ER baseline is currently scoped as excavation of contaminated soils with offsite shipment of the excavated soils If HRC™ is successful in remediation of contaminated groundwater and soils at Rocky Flats, it can be used to replace excavation as the remedial action for a number of VOC-contaminated sites This use of chemicals designed to enhance the naturally occurring degradation already known to be occurring in the environment will have a positive impact on the baseline cost and schedule Stakeholder acceptance of the process is anticipated as a result of the presentations made to date, and the successful completion of the test projects discussed below

The initial test of HRC™ to remediate subsurface soils and groundwater is being conducted at an isolated location to determine if this methodology is successful in the shallow, low flow groundwater at the Site, and to determine whether or not undesirable byproducts are generated during the process

Follow-on tests are proposed at five locations at the Site Two geoprobe wells will be installed and sampled along with existing wells to determine baseline conditions Then HRC will be inserted into the subsurface using the techniques developed in the initial phase of the test Beginning two months after material insertion, groundwater monitoring for VOCs only will begin and continue for 6 months The preliminary test areas are

Area 1 – Limiting lateral extent of a plume Groundwater flow is primarily to the east within the Rocky Flats Alluvium However, near the southern edge of the mesa, the plume extends to the south in the vicinity of the Original Landfill Insertion of HRC in this area may limit the extent of the plume in this area

Area 2 – Potentially diffuse source area Higher contaminant concentrations are observed in the PU&D Yard Plume at the distal end of the plume away from the known source area While this area was previously investigated and no source was found, it is expected that there is a diffuse contaminant source located in the area This application will test whether this is an effective technique for diffuse source areas

Area 3 – Higher groundwater concentrations following remedial action An area downgradient of a previous remedial action has shown higher contaminant concentrations after the remedial action was completed It is assumed that these concentrations are a result of leaving the excavation open, that then filled with storm water and groundwater for approximately one year after the remediation was completed, but prior to backfilling the excavation with treated soils This may have flushed additional water through the residual contamination and temporarily increased the contaminant flux in this portion of the plume Application of HRC within the previous excavation boundary will evaluate whether materials can be added at the end of the remedial action and prior to backfill to reduce the potential mobilization of contamination as a result of remedial actions

Area 4 – Under building groundwater contamination A small, very-low level VOC plume is apparently migrating from beneath the Building 123 slab Building 123 was demolished in 1998 and recent investigations did not identify any contaminants in the subsurface soils This application will determine the effectiveness of enhanced degradation of VOCs under these conditions

Area 5 – Zone of Sacrifice Groundwater plume collection and treatment systems are in place for two VOC-contaminated groundwater plumes Downgradient of the plume collection systems are high concentration portions of the plume These portions of the plumes are being left in-place to degrade over time Material will be tested in the higher contaminated portions of the plume areas to see if the degradation rate can be accelerated

1.2 Technical Merit

Introduction of HRC™ into the subsurface to accelerate degradation of VOC contaminated soils and groundwater is already undergoing limited testing at Rocky Flats Environmental Technology Site The use of this innovative approach is anticipated to reduce the need to excavate some types of contaminated soils with the subsequent requirement for offsite dispositioning and/or treatment

If HRC™ can be demonstrated to accelerate degradation of VOC contaminants in subsurface soils and groundwater, this will provide an expedited approach to remediation of VOC contamination As compared to traditional excavation of contaminant sources, this approach is low in cost, easy to apply, and greatly reduces the health and safety risks to workers as opposed to traditional excavation The proposed approach also greatly reduces waste generated and dispositioned because no materials are excavated Instead of excavating and disposing of many cubic meters of contaminated soils, waste is limited to personal protective equipment and miscellaneous expendable materials As a result, waste storage and transportation costs are minimized

1.3 Site Need

The Rocky Flats ER Baseline currently contains funding to perform 100 remedial action source removals prior to 2006 in order to close the Site Most of the remedial actions are expected to be for VOC- or radiologically contaminated soils and/or groundwater In addition, another groundwater collection and treatment system is planned in the ER baseline If this technique is proven successful, it can be deployed to effectively remediate VOC-contaminated soils It may also be used in conjunction with source removal of mixed radiological and VOC contamination to reduce the size of the final groundwater collection and treatment system

1.4 Technology Selected

HRC™ enhancement of natural degradation of VOC contaminants was selected based on the success at other DOE and commercial sites The Site conditions at Rocky Flats are significantly different than at the locations previously used However, based on the reduction of worker risk over conventional methods, the potential for large cost and schedule savings, and the ability to significantly reduce generation of waste, this technique was identified for testing at Rocky Flats

1.5 ISMS Integration

Use of Integrated Safety Management System (ISMS) is an integral part of all work conducted at Rocky Flats and will continue to be integrated into this project Workers assisted in development of the original job hazard analysis and will be involved in any revisions required for this project Workers were involved in the planning and their suggestions greatly enhanced completion of the initial test Because of the worker involvement in the health and safety and job planning, the initial test was completed without any incidents or injuries Worker input again will be actively solicited during performance of this work scope

Use of the Site's geoprobe crew is anticipated This crew is familiar with their responsibilities under ISMS and is eager to contribute suggestions, comments and concerns Additional hazards from the new project sites will be identified in advance and controls incorporated as appropriate Lessons learned from similar projects across the complex will be incorporated into the work implementation documents as appropriate Lessons learned from the initial phase of the project will also be utilized during the project Meetings are held daily during fieldwork to discuss the work in progress, voice concerns, identify issues and develop solutions

Use of the new technology instead of traditional excavation will also minimize worker health and safety risks and the environmental impacts caused by excavation Workers will be at less risk because their contact with contaminated media is minimal, as the materials will be placed into the subsurface using geoprobe holes instead of excavating into the materials Heavy equipment will not be used, minimizing worker risk from operation of equipment The potential for air releases is minimal due to the small quantity of the material exposed during drilling Habitat damage will be minimized, because of the small area disturbed Spill potential will be minimized because contaminated materials will not be exposed at the surface

1.6 Stakeholder/Regulatory Acceptance

The Environmental Protection Agency (EPA) technical representative for the ER Program has been a strong supporter of this type of remedial action and suggested one of the locations described above for study

Discussions were held with the Colorado State Department of Health (CDPHE) technical representatives and the EPA prior to initiation of the previous phase of the project Regular data updates were provided to the regulators during the first phase of the project and informal discussions were conducted The preliminary results of the initial phase will be presented to other Stakeholders within the next month To date, there have been only positive comments received on this project

2.0 Cost Proposal

2.1 Cost Benefit Analysis

Excavation and treatment or waste dispositioning of soils has traditionally been performed at Rocky Flats Along with the increased worker safety and health risks

associated with working with heavy equipment, these are expensive, time-consuming projects If the technique described in this proposal is effective at Rocky Flats, substantial cost and schedule savings will be result that will facilitate closure of the Site

For comparison, the Trench 3/Trench 4 remedial action cost approximately $3 5 million for excavation and treatment of the contaminated soils If this technique is proven successful, remediation of a similar sized area could potentially cost around $100,000 to $200,000 Monitoring costs would be similar as both excavation and enhanced degradation require approximately the same duration and type of long term monitoring

2.2 OST Funding Request

The following assumptions were made for each project site

- The treatability study work plan for the project already in progress will be amended to include the additional project areas No additional planning documents will be required
- The health and safety plan for the treatability project in progress will be amended to include the additional project sites and include area specific job hazard analyses No additional project execution documents will be required
- HRC™ will be introduced into the subsurface using the Site crew and a leased geoprobe Twenty geoprobe locations will be required for each area No additional equipment will be required
- As per the manufacturer's directions, subsurface conditions will be allowed to stabilize for two months prior to sampling
- Two new geoprobe wells will be installed at each area to monitor progress Existing wells in each project area will also be used to monitor progress
- Six months monitoring data will be sufficient to determine whether the process is successful in remediating subsurface contaminants

Cost and schedule for each project test area will be similar and are detailed below

TASK	COST	DURATION
Document revision	$ 7,500	3 weeks
Agency review		20 days
Well installation- 2 wells at $5,000 each	$10,000	1 5 weeks
HRC™ introduction at 20 Material Insertion Points	$30,000	2 weeks
Groundwater Monitoring (VOCs only)	$19,200	6 months
Project Management/Reporting	$ 8,000	
Total per project test area	$74,700	

Total cost for all 5 project test areas is estimated at $373,500

2.3 Amount of Funding/Services provided by the Site

The Site will provide funding for the labor cost for collecting groundwater samples The Site will also fund any long term monitoring at the pre-existing monitoring wells and additional monitoring requirements beyond those stated in this proposal

2.4 Current and Out-Year Spend Plan

The funding detailed in section 2 2 above will be spent in the year received, assuming that funds are received prior to mid-way through the fiscal year Out-year costs will be borne by the Site

3.0 Project Baseline Summary Benefit

As noted in section 1 3, over 100 remedial actions are planned over the next five years at this Site These remedial actions are currently scoped for excavation with offsite dispositioning of the excavated soils As presently scoped, backfill will be purchased from offsite sources to fill the excavations Remedial actions take months to complete with the average time around six months per action Based on the short timeframe and the number of actions required, numerous excavation crews will be working simultaneously over the next several years to complete these tasks

If successfully demonstrated at Rocky Flats, this technique is expected to be used at numerous project sites The benefits for each project site are

- Reduced worker health and safety risks during implementation,
- Up to five months of schedule savings
- Up to $3 million cost savings
- Minimal waste generation with the associated storage, handling, shipping and disposal costs

In addition, if this project is successful, the planned remaining groundwater collection and treatment system, currently scheduled to be initiated in 2003 and completed in 2004 for a projected cost of $2 6 million, can be greatly reduced in scope or potentially eliminated

4.0 Performance Milestones

Following are the proposed milestones – dates will depend upon when funding is received

- EPA and CDPHE acceptance of amended work plan
- Initiation of field work for each project test area
- Completion of field work for each project test area
- Initiation of monitoring for each project test area
- Completion of 6-month monitoring for each project test area
- Completion of Project Report containing ROI costs and lessons learned
- Completion of Technology Safety Data Sheet

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